

What is Claimed is:

1. An air conditioning system comprising:

a duct having a suction passage for drawing external air and a discharge passage for discharging room air, the suction passage and the discharge passage being split with a split
5 plate;

a suction fan and a discharge fan in the suction passage and the discharge passage, respectively;

a dehumidifier having a desiccant wheel rotatably mounted in an opening in a split plate of the duct to cross, and exposed to the suction passage and the discharge passage;

10 a regenerative heater in the discharge passage of the duct adjacent to air inlet of the dehumidifier for heating the air introduced into the dehumidifier;

a regenerative heat exchanger mounted both in the suction passage and the discharge passage on a room side with reference to the dehumidifier for making heat exchange of the air flowing in the suction passage and the air flowing in the discharge passage; and

15 a heat pump having a first heat exchanger in the discharge passage between the dehumidifier and the regenerative heat exchanger, and a second heat exchanger in the suction passage on the air outlet of the regenerative heat exchanger.

2. The air conditioning system as claimed in claim 1, further comprising:

20 a regenerative heater in the discharge passage of the duct adjacent to an air inlet of the dehumidifier for heating the air introduced into the dehumidifier.

3. The air conditioning system as claimed in claim 1, wherein the desiccant wheel

having desiccant attached to an outside surface for capturing moisture contained in the air drawn through the suction passage, and discharging the captured moisture when positioned in the discharge passage as the desiccant wheel is turned.

5 4. The air conditioning system as claimed in claim 3, wherein the desiccant wheel has one half exposed to the suction passage and the other half exposed to the discharge passage.

 5. The air conditioning system as claimed in claim 3, wherein the desiccant is silica gel.

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 6. The air conditioning system as claimed in claim 3, wherein the desiccant is titanium silicate.

 7. The air conditioning system as claimed in claim 3, wherein the desiccant wheel
15 includes;

 a shaft mounted on the opening,

 paddles each having a fixed width and extended from the shaft in a radial direction,

 and

 a rim surrounding ends of the paddles.

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 8. The air conditioning system as claimed in claim 7, wherein the paddle includes a plurality of air pass holes.

 9. The air conditioning system as claimed in claim 7, wherein the duct is circular in

conformity with an outside shape of the rim.

10. The air conditioning system as claimed in claim 7, wherein the paddle has a fixed width in an air flow direction along the discharge passage and the suction passage.

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11. The air conditioning system as claimed in claim 1, wherein the suction passage and the discharge passage cross in the vicinity of the regenerative heat exchanger, and the regenerative heat exchanger is mounted in a crossed part of the suction passage and the discharge passage.

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12. The air conditioning system as claimed in claim 11, wherein the regenerative heat exchanger includes;

a first flow passage in communication with the suction passage for flow of drawing air, and

15 a second flow passage in communication with the discharge passage for flow of discharging air.

13. The air conditioning system as claimed in claim 12, wherein the regenerative heat exchanger includes a plurality of corrugated plates stacked perpendicular to each other to
20 form layers of the first flow passage and the second flow passage alternately.

14. The air conditioning system as claimed in claim 13, wherein the regenerative heat exchanger further includes a plurality of flat plates each inserted between adjacent corrugated plates for separating the first and second flow passages.

15. The air conditioning system as claimed in claim 1, wherein the heat pump further includes;

a four way valve for switching a flow direction of refrigerant flowing through the first
5 heat exchanger and the second heat exchanger, and
an expansion device for expanding the refrigerant.

16. The air conditioning system as claimed in claim 15, wherein the four way valve is switched to a state an outlet of the compressor and the first heat exchanger are connected, and,
10 at the same time, the second heat exchanger and the inlet of the compressor are connected when the room is heated, and switched to a state the outlet of the compressor and the second heat exchanger are connected, and, at the same time, the first heat exchanger and the inlet of the compressor are connected when the room is cooled.

17. An air conditioning system comprising:

a duct having a suction passage for drawing external air and a discharge passage for discharging room air, the suction passage and the discharge passage being split with a split plate;

a suction fan and a discharge fan in the suction passage and the discharge passage,
20 respectively;

a dehumidifier having a desiccant wheel rotatably mounted in an opening in a split plate of the duct to cross, and exposed to the suction passage and the discharge passage;

a regenerative heat exchanger mounted both in the suction passage and the discharge passage on a room side with reference to the dehumidifier for making heat exchange of the air

flowing in the suction passage and the air flowing in the discharge passage; and

a regenerative heater in the discharge passage of the duct adjacent to air inlet of the dehumidifier for heating the air introduced into the dehumidifier;

5 a parallel passage in, and parallel to the discharge passage between the dehumidifier and the regenerative heat exchanger; and

a heat pump having a first heat exchanger in the parallel passage of the discharge passage, and a second heat exchanger in the suction passage on the air outlet of the regenerative heat exchanger.

10 18. The air conditioning system as claimed in claim 17, wherein the parallel passage includes a detachable duct on an outlet side of the first heat exchanger.

19. The air conditioning system as claimed in claim 17, further comprising a fan adjacent to the first heat exchanger.

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20. The air conditioning system as claimed in claim 17, wherein the desiccant wheel having desiccant attached to an outside surface for capturing moisture contained in the air drawn through the suction passage, and discharging the captured moisture when positioned in the discharge passage as the desiccant wheel is turned.

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21. The air conditioning system as claimed in claim 17, wherein the desiccant wheel has one half exposed to the suction passage and the other half exposed to the discharge passage.

22. The air conditioning system as claimed in claim 20, wherein the desiccant is silica gel.

23. The air conditioning system as claimed in claim 20, wherein the desiccant is titanium silicate.

24. The air conditioning system as claimed in claim 17, wherein the desiccant wheel includes;

a shaft mounted on the opening,

10 paddles each having a fixed width and extended from the shaft in a radial direction, and

a rim surrounding ends of the paddles.

25. The air conditioning system as claimed in claim 24, wherein the paddle includes a plurality of air pass holes.

26. The air conditioning system as claimed in claim 24, wherein the duct is circular in conformity with an outside shape of the rim.

20 27. The air conditioning system as claimed in claim 24, wherein the paddle has a fixed width in an air flow direction along the discharge passage and the suction passage.

28. The air conditioning system as claimed in claim 17, wherein the suction passage and the discharge passage cross in the vicinity of the regenerative heat exchanger, and the

regenerative heat exchanger is mounted in a crossed part of the suction passage and the discharge passage.

29. The air conditioning system as claimed in claim 28, wherein the regenerative heat
5 exchanger includes;

a first flow passage in communication with the suction passage for flow of drawing
air, and

a second flow passage in communication with the discharge passage for flow of
discharging air.

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30. The air conditioning system as claimed in claim 28, wherein the regenerative heat
exchanger includes a plurality of corrugated plates stacked perpendicular to each other to
form layers of the first flow passage and the second flow passage alternately.

15 31. The air conditioning system as claimed in claim 30, wherein the regenerative heat
exchanger further includes a plurality of flat plates each inserted between adjacent corrugated
plates for separating the first and second flow passages.

20 32. The air conditioning system as claimed in claim 17, wherein the heat pump
further includes;

a four way valve for switching a flow direction of refrigerant flowing through the first
heat exchanger and the second heat exchanger, and

an expansion device for expanding the refrigerant.

33. The air conditioning system as claimed in claim 32, wherein the four way valve is switched to a state an outlet of the compressor and the first heat exchanger are connected, and, at the same time, the second heat exchanger and the inlet of the compressor are connected when the room is heated, and switched to a state the outlet of the compressor and the second
5 heat exchanger are connected, and, at the same time, the first heat exchanger and the inlet of the compressor are connected when the room is cooled.